Drug Distribution in Hair Determined by Infrared Microspectroscopy	U2B

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Localization of drug metabolites within human hair is important in determining the pharmacokinetics of drug incorporation in hair. This information is critical to validate drug testing data from hair. Microspectroscopic probing of small areas ($<10\mu$m in diameter) within longitudinally microtomed hair sections provides a profile of the drug deposition along a growth line and thus indicates localization as a function of time. Probing across individual hairs may reveal the hydrophobic/hydrophilic characteristics of the substance. Hydrophobic drugs tend to bind to the central core of the hair medulla, while hydrophilic drugs tend to be spread throughout the cortex of the hair, and generally appear in lower concentrations per dose. High spatial resolution distribution profiles of hair regions are necessary for these determinations. This information is not readily available through conventional infrared microspectroscopy.

Initial work at the NSLS infrared microspectrometer has shown the feasibility of resolving the drug incorporation issue. Sample handling has been determined and initial work with spiked or doped hairs has shown the presence of drugs in the protein profile. Previous data by conventional infrared microscopy has not been sensitive enough to show evidence of the drug in the hair without extensive data manipulation. The figure below shows NSLS IR microscope protein spectra of spiked hairs superimposed on a reference hair spectrum. The indicated band in the spiked hairs at 1735 cm^{-1}, which is not present in the reference spectrum, is the carbonyl band of 6-monoacetyl morphine (the primary metabolite of heroin). Unfortunately, contamination from a sample preparation procedure led to an absorption which obscured distribution profiles. Corrective preparation techniques have been devised and subsequent data collections at the NSLS are expected to reveal the distribution profiles. We also anticipate obtaining high spatial resolution information, which is required for determining drug transport and binding in hair, using the synchrotron infrared microspectrometer system.

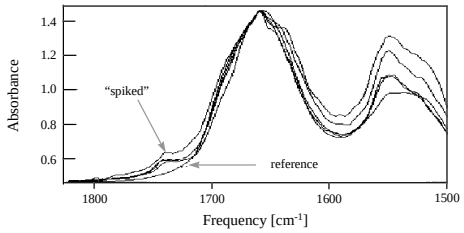

Figure 1. Spectra from micro-sections of reference (drug-free) and spiked hair, showing the shoulder at 1735 cm^{-1} associated with heroine metabolite.